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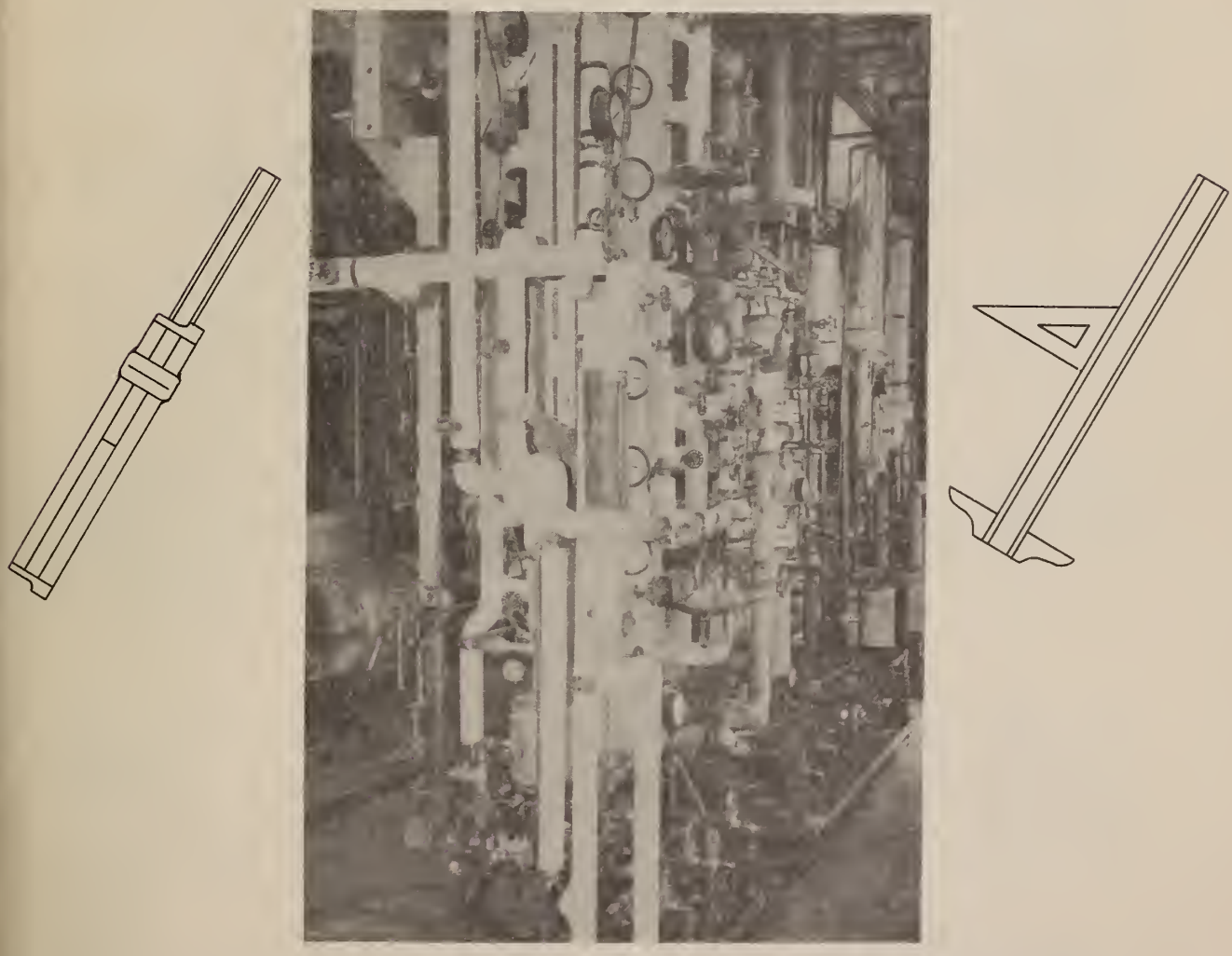

BUREAU OF AGRICULTURAL AND INDUSTRIAL CHEMISTRY
AGRICULTURAL RESEARCH ADMINISTRATION
UNITED STATES DEPARTMENT OF AGRICULTURE

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INTRODUCTION

Data previously obtained (1) on boiling point-vapor pressure-constant composition parameters for crude cottonseed oil-commercial hexane miscellas and crude peanut oil commercial hexane miscellas are replotted in English units; namely, in inches of mercury vacuum and in degrees of temperature Fahrenheit. The purpose is to render these data more useful and suitable for design calculations, plant operations, and interpretations of operating data. The original curves are in metric units whereas design and operation engineers generally work with English units. English units are most useful to process development engineers in conformance with scale units of the usual plant instruments.

The ranges of pressures, temperatures and compositions are the same as in the experimental work and are applicable to operating conditions, current industrial vegetable oil solvent-extraction technology and to the design of oil and solvent recovery equipment used in solvent-extraction and solvent-crystallization processes.

Original data consists of boiling point-composition tables at constant pressures. In the present work these data are plotted as intermediate curves. Values of temperature vs. pressure were taken off the intermediate curves at constant compositions. This set of readings is plotted as Figures 1 and 2.

DESCRIPTION OF VAPOR PRESSURE CHARTS

The data plotted in Figures 1 and 2 are in good agreement with values calculated by Raoult's Law up to approximately 50% oil by weight (1). Above 50% the deviations are appreciable, and become increasingly greater as the oil content of the miscella approaches 100%. The use of Raoult's Law hence yields erroneous results. For compositions above 80% oil by weight, Dühring's rule does not hold. Consequently, these curves are based on experimental values.

The temperature is plotted along the ordinate in degrees Fahrenheit; the vacuum is plotted along the abscissa in inches of mercury, for constant composition parameters at 0, 50, 60, 70, 80, 85, 90, 93, 95, 97, and 98% oil by weight. The 98% oil by weight curves are not as accurate as the others because of the steepness and asymptotic nature of isobars in temperature-composition plots made directly from data previous to construction of these constant composition parameters, hence making only two points obtainable for plotting of this parameter.

The hexane used in the original work was a commercial solvent with the following specifications: gravity at 60° F., 74.4° A.P.I.; boiling range 140-160° F.; vapor pressure at 100° F. (Reid), 5.1 lbs./sq. in.; evaporation residue by weight, 0.0016%; color, water-white. Refining test data of the crude cottonseed and peanut oils were as follows: (a) crude cottonseed oil: free fatty acids (as oleic) 3.5%, specific gravity at 30° C. 0.913, refining loss 12.5%, moisture 0.093%; (b) refined cottonseed oil from crude: iodine number 105.5, color 35Y-14.4R, color of bleached oil 35Y-5.5R; (c) crude peanut oil: free fatty acid (as oleic) 0.85%, specific gravity at 30° C. 0.909, refining loss 4.8%, moisture 0.066%; (d) refined peanut oil from crude: iodine number 97.9, color 35Y-2.3R, color of bleached oil 2Y-0.5R.

ACKNOWLEDGMENT

The work reported here was carried out in the Engineering and Development Division at the Southern Regional Research Laboratory under the general supervision of E. A. Gastrock, Head, Engineering and Development Division. The recalculation of data and plotting of curves were performed under the direct review of Henri J. Molaison, Acting Head of that Division's Design Section. The work is an addition to work reported by Pollard, Vix and Gastrock cited above. Jack E. Hawkins performed the final drafting work.

REFERENCE

(1) Pollard, E. F., Vix, H. L. E., and Gastrock, E. A. Solvent Extraction of Cottonseed and Peanut Oils. Boiling Point-Vapor Pressure-Composition Relations for Miscellas of Oils in Hexane. Industrial and Engineering Chemistry, Vol. 37, page 1022, October 1945.

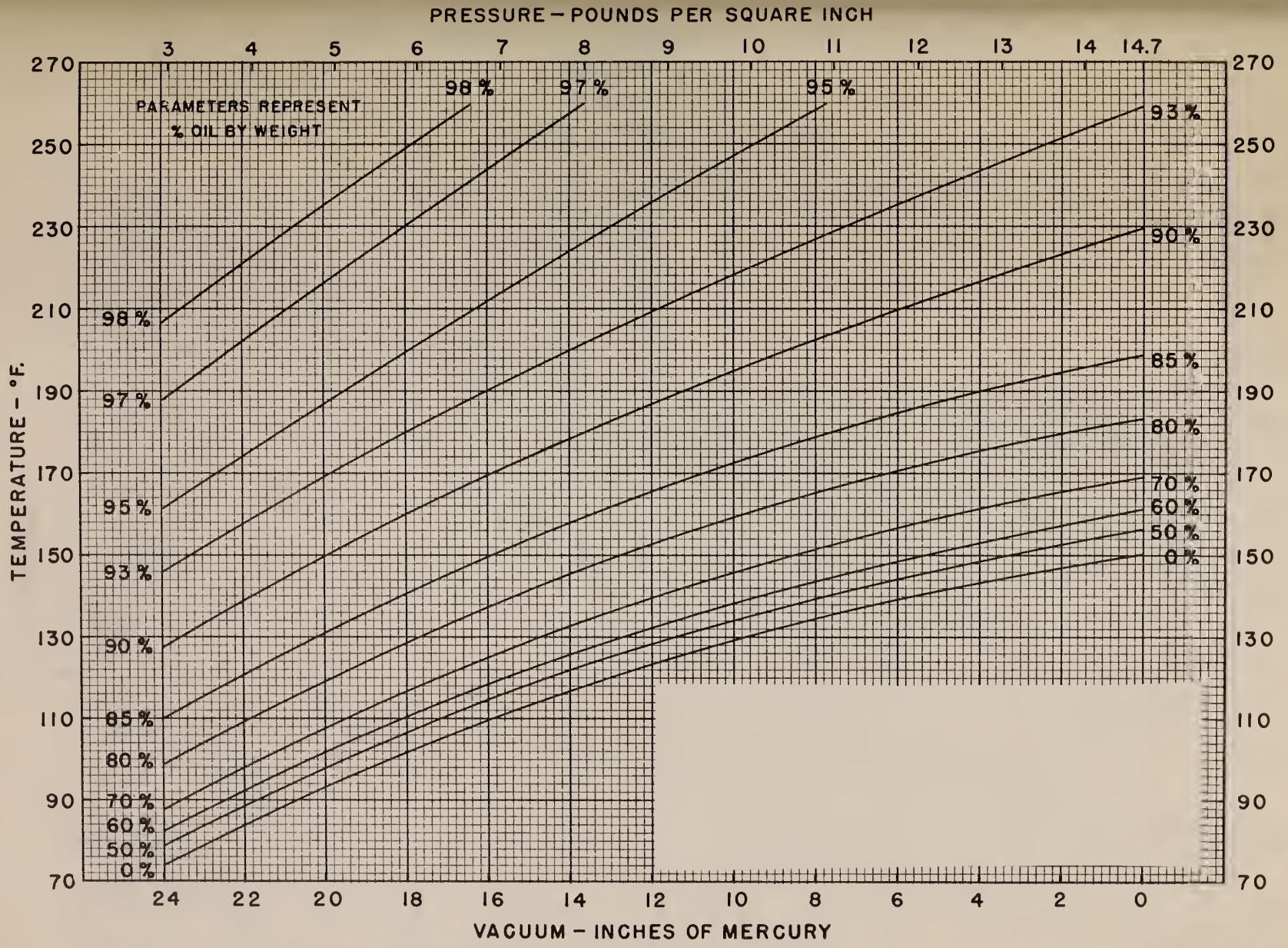

FIGURE 1

BOILING POINTS

CRUDE COTTONSEED OIL – COMMERCIAL HEXANE MIXTURES

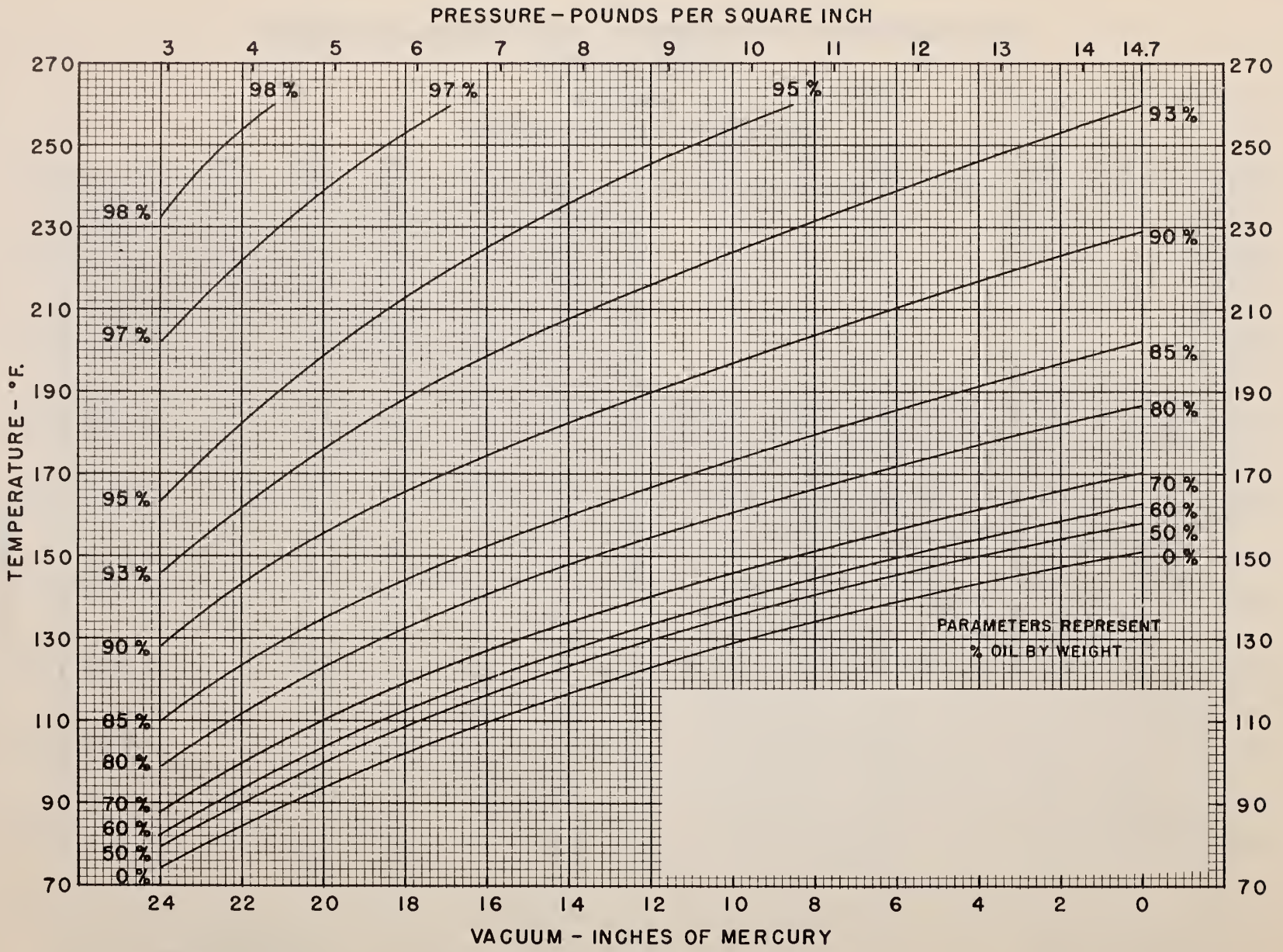

FIGURE 2

BOILING POINTS

CRUDE PEANUT OIL – COMMERCIAL HEXANE MIXTURES